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Thyroid carcinoma with extensive tumor thrombus in the superior vena cava: A case report



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ABSTRACT

INTRODUCTION: Venous tumor thrombus of thyroid cancer that extend to the great vein is rare, and management criteria for venous thrombus have not been established yet. We report a surgical case of thyroid carcinoma with extensive tumor thrombus in the superior vena cava (SVC) and consider the appropriate treatment strategy for venous thrombus.

PRESENTATION OF CASE: A 75-year-old woman consulted our hospital because of thyroid carcinoma with an extensive tumor thrombus. Computed tomography (CT) revealed a solitary thyroid mass with extensive continuous tumor thrombus in the left internal jugular vein, innominate vein, and SVC. We planned complete tumor resection. During operation, the tumor thrombus in the SVC disappeared, suggesting that pulmonary embolism occurred. Therefore, she underwent total thyroidectomy with extensive phlebectomy (the innominate and internal jugular veins). Although she had some morbidities during her postoperative course, she was followed up for 6 months without progression of thyroid cancer.

DISCUSSION AND CONCLUSION: Intravascular tumor extension of thyroid carcinoma is rare, but is a life-threatening complication. For patients with thyroid tumor with venous tumor thrombus, segmental resection and thrombectomy should be considered if radical operation is possible. Therefore, preoperative correct imaging evaluation and operative planning are necessary to perform safe and effective operations. We suggest a management criteria for patients with thyroid carcinoma with venous tumor thrombus.

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1. Introduction

Venous tumor thrombus of thyroid cancer is occasionally experienced, but tumor thrombus extending to the great vein such as the innominate vein and superior vena cava (SVC) is rare [1]. The treatment criteria for tumor thrombus in the great vein have not been established yet. The management of this condition is always challenging and requires a careful approach. Herein, we report a surgical case of thyroid carcinoma with tumor thrombus extending to the left internal jugular vein, innominate vein, and SVC. Presented case has been reported in line with the SCARE criteria [2].

2. Case presentation

A 75-year-old woman noticed a cervical mass and was admitted to a primary care hospital. Cervical ultrasonography revealed a thyroid mass and venous thrombus, so she was referred to our institution for treatment. Pertinent findings on physical examination

showed a firm mass on the left clavicle region. The mass extended toward the lower left jaw. She has a past medical history for hypertension, but has no family history for thyroid carcinoma or other malignancy. Ultrasonography confirmed a 45 × 30 mm solitary thyroid mass of the upper pole of the left lobe of the thyroid gland and solitary lesion in the left internal jugular vein. Fine-needle aspiration cytological examination of the thyroid mass revealed clusters of atypical follicular cells and mesenchymal-like cells, suggestive of poorly differentiated carcinoma. Computed tomography (CT) revealed left internal jugular vein thrombus extending to the innominate vein and SVC (Fig. 1). Furthermore, the thrombus reached the left intracranial sigmoid sinus. According to the abnormal accumulation along the left internal jugular vein from the innominate vein on thyroid scintigraphy and fluoro-deoxy-D-glucose-positron emission tomography, she was diagnosed with thyroid carcinoma with an extensive venous tumor thrombus. No distant metastasis and tumor thrombus were found in the right atrium and pulmonary artery. We planned total thyroidectomy and extensive phlebectomy by endocrine and cardiovascular surgeons. We also planned SVC reconstruction.

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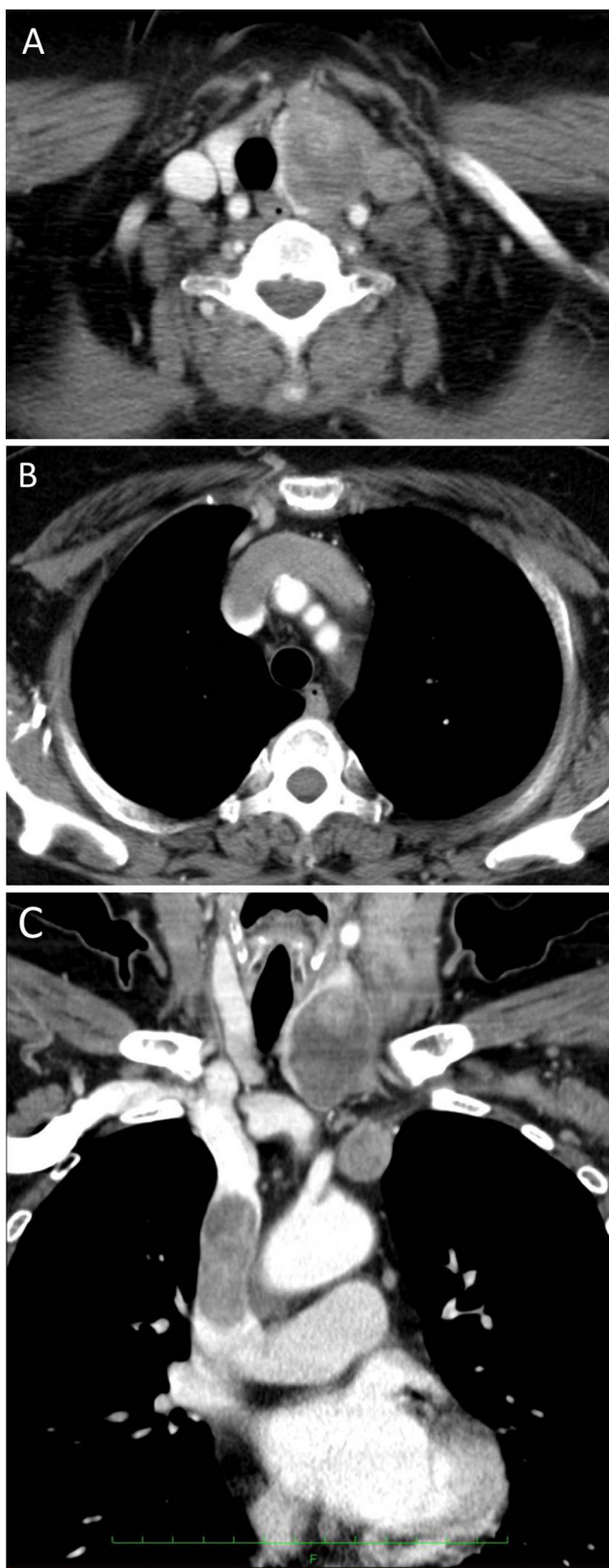


Fig. 1. Computed tomographic image showing a 50-mm mass in the left lobe of the thyroid gland and thrombus in the left internal jugular vein (A) and venous thrombus extending to the innominate vein and superior vena cava (B, C).

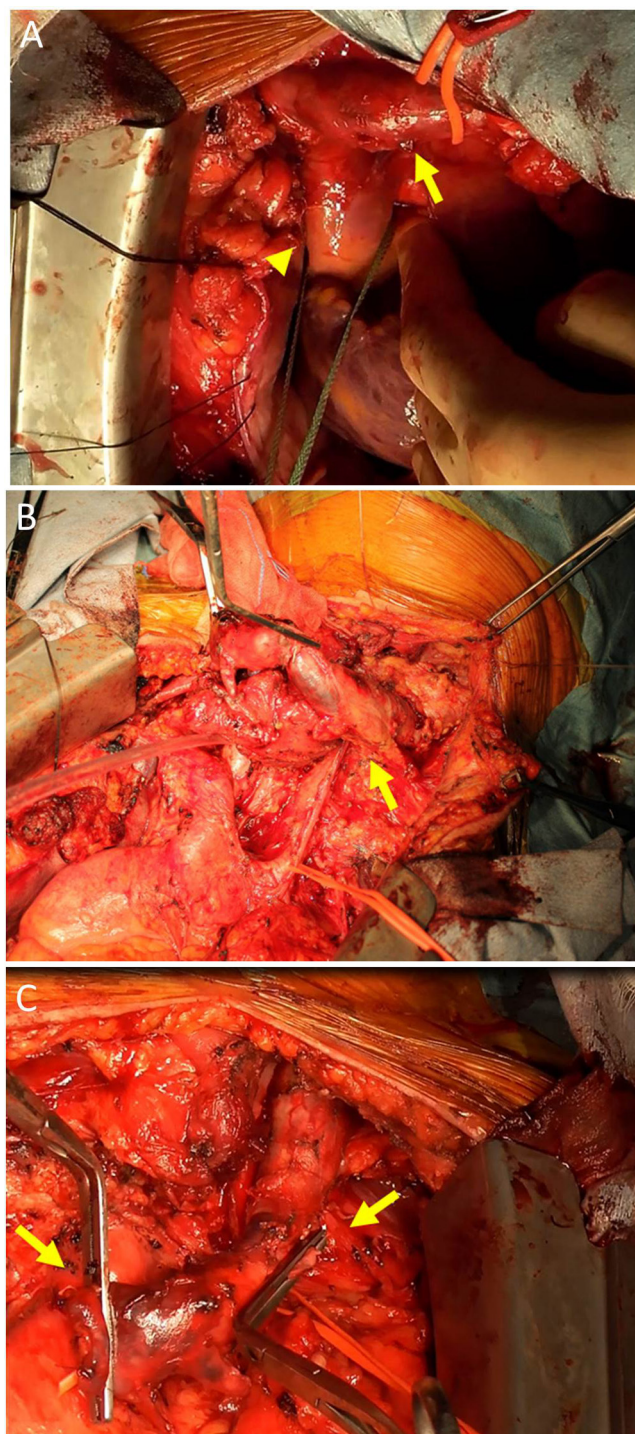


Fig. 2. Operative findings: The innominate vein (arrow) and left internal jugular vein (arrowhead) are hardly palpable (A). The innominate and left subclavian veins are transected (arrow), and the tumor thrombus is resected (B). Total thyroidectomy and prophylactic lymph node dissection of the central compartment are performed, and the left internal jugular vein (arrow) is transected near the processus styloideus (C).

2.1. Operative findings

Under general anesthesia, she was placed in the thyroid position. The operation was started with median sternotomy. First, we exposed the innominate vein and SVC. We recognized that they were hardly pervasible and adhered to the surrounding tissue (Fig. 2A). The tumor thrombus in SVC reached the vicinity of

the right atrium; therefore, we planned taping it to prevent pulmonary embolism. However, sudden hypotension and arrhythmia occurred during the taping of the SVC. After this event, we lost the tumor in the SVC. We thought that the tumor thrombus in the SVC was separated and pulmonary embolism occurred. Considering that the circulatory dynamics was stable, we did not remove the tumor thrombus of the pulmonary artery. The left subclavian and innominate veins were subsequently transected and extraction of the tumor thrombus was completed (Fig. 2B). Total thyroidectomy and prophylactic lymph node dissection of the central compartment were performed by using an additional collar-shaped incision. The left internal jugular vein was transected near the processus styloideus (Fig. 2C). The edge of the tumor thrombus was detected at the facial vein on the submandibular gland, for which we performed transection of the vein, not to reduce the tumors in the jugular vein.

2.2. Histopathological findings

On macroscopic examination, the thyroid tumor occupied the left lobe and was connected to the left internal jugular vein, with direct infiltration of the innominate and left internal jugular veins (Fig. 3A). Intravenous tumor invasion was found in the sectioned surface (Fig. 3B). On microscopic examination, the tumor consisted of atypical follicular cells with round to oval, enlarged, hyperchromatic nuclei and notable nucleoli proliferation in a sheet- or nest-like pattern (Fig. 3C). Vascular invasion and lymphatic permeation were extensive, as well as necrosis. The thyroid tumor invaded the luminal spaces of the left internal jugular and innominate veins. The final pathological diagnosis was thyroid undifferentiated carcinoma (T4b, N0, M0, stage IV B).

2.3. Postoperative course

After the operation, she received care in the intensive care unit. Extubation of the tracheal tube and oral intake was difficult because of prolonged severe edema of the upper respiratory tract. Therefore, we performed tracheotomy and gastrostomy. Postoperative enhanced CT revealed a tumor thrombus in the right and left inferior pulmonary arteries (Fig. 4A). We removed the tumor embolism by using interventional radiology 12 days after the surgery. Pulmonary arteriography revealed a contrasting defect of the right inferior pulmonary artery from that of the left inferior pulmonary artery (Fig. 4B). We performed aspiration thrombectomy using a thrombus suction catheter by percutaneous venous interventions. After the percutaneous venous interventions, the left lower pulmonary artery could be contrasted clearly on pulmonary arteriography (Fig. 4C).

She required long-term rehabilitation for respiratory disorder and dysphagia. However, she was followed up without progression of thyroid cancer by CT and ultrasonography. The tumor thrombus in the left pulmonary artery decreased in size on follow-up CT 6 months after the surgery (Fig. 5).

3. Discussion

Tumor thrombus in the great vein is sometimes detected in patients with renal cell, adrenal cortical, testicular and hepatocellular carcinomas [3]. In 1879, Kaufmann and Graham reported the first two cases of vascular tumor thrombus associated with thyroid cancer [4]. It has been generally accepted that patients with malignancies with vascular invasion have poor prognoses. In thyroid cancer, extensive vascular invasion or venous tumor thrombus should be considered as a risk factor of distant metastases or early relapse [5]. Thyroid cancer is a generally slow-growing tumor; therefore, tumor thrombus of thyroid cancer in a major vein is rare. The incidence of tumor thrombus of thyroid cancer has

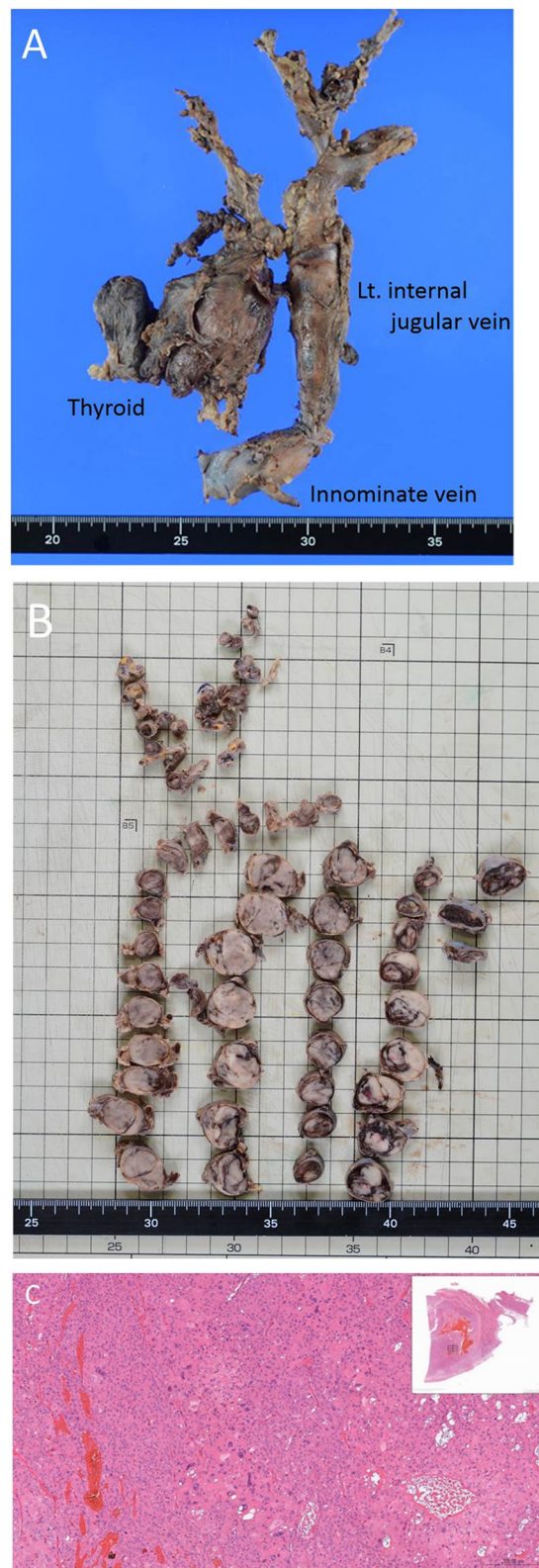


Fig. 3. Macroscopic view of the resected thyroid tumor and tumor thrombus (A), and the cross-section (B). Microscopic examination result showing that the tumor consisted of atypical follicular cells in a sheet- or nest-like pattern (C).

been reported to be 0.2–3.8% [5–7]. The venous tumor thrombus of thyroid cancer has been known to occur in direct primary tumor invasions of the thyroid drainage and adjacent internal jugular veins [8], and metastatic lymph nodes [9]. Koike et al. [9] reported that the various tumor pathologies may explain the different paths

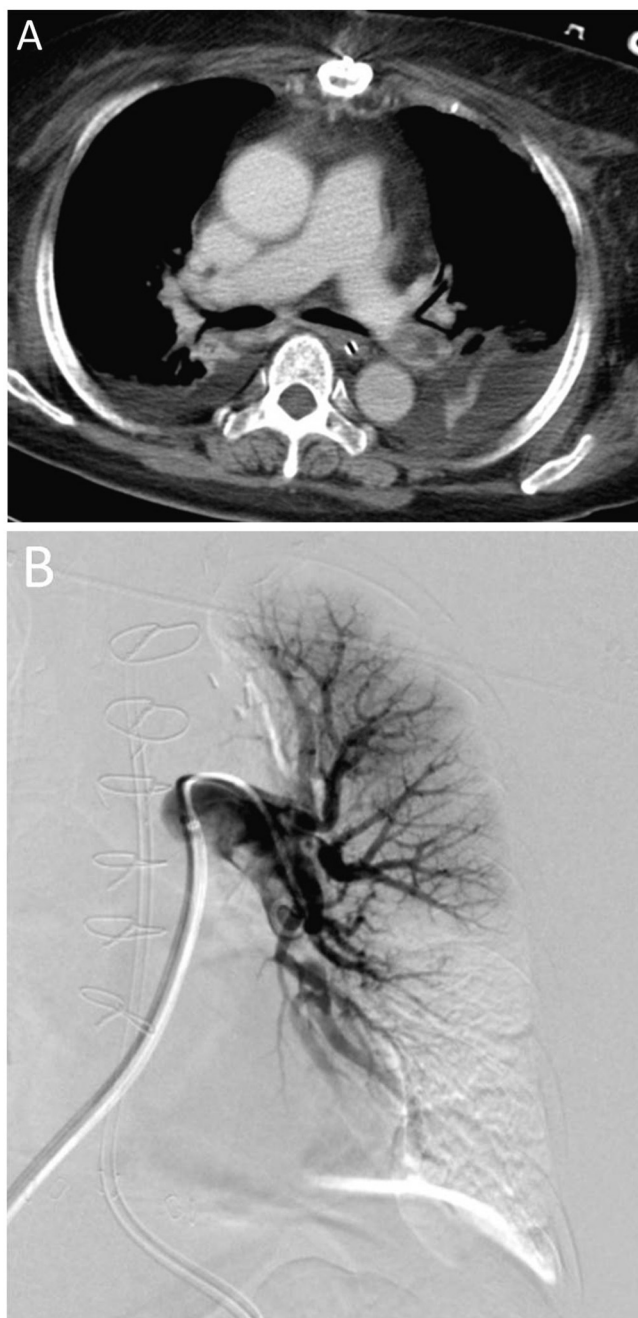


Fig. 4. Postoperative contrast-enhanced computed tomographic image showing tumor thrombus in the left and right inferior pulmonary arteries, 12 days after surgery (A). Pulmonary arteriographic image showing the contrasting defect of the right inferior pulmonary artery from that of the left inferior pulmonary artery. After percutaneous venous interventions, the lower left pulmonary artery could be contrasted clearly on pulmonary arteriography (B).

of tumor invasion to a great vein. Only a few reports have shown thyroid cancer patients with tumor thrombus that progress to the innominate vein, SVC, and intracranial sigmoid sinus beyond the internal jugular vein [1,9–11]. Yamagami et al. [12] reported a case of thyroid cancer with extensive tumor thrombus in the atrium.

Many of the cases of venous tumor thrombus of thyroid cancer are asymptomatic and accidentally detected on ultrasonography and CT [7]. However, patients with tumor thrombus in the SVC often show the SVC syndrome [1,13]. Detection of tumor thrombus is important for the planning of operative procedures. Ultrasonography is useful and available for detection of small tumor thrombi.



Fig. 5. Postoperative contrast-enhanced computed tomographic image obtained 6 months after surgery showing that the tumor thrombus in the left pulmonary artery had decreased in size.

With regard to the management of venous tumor thrombus of thyroid cancer, no guidelines have been established yet (including Japanese thyroid tumor guidelines) [4]. Surgical resection or thrombectomy for tumor thrombi in the internal jugular vein has been reported. Most endocrine surgeons tend to perform thrombectomy or segmental resection of the internal jugular vein if the tumor thrombus spreads into internal jugular vein [14,15]. Arnold et al. [16] reported that if thyroid tumor in the vessel is resected without residual tumor, good prognosis is possible. Furthermore, they also showed few major complications of unilateral resection of the internal jugular vein. The so-called radical neck dissection with resection of the internal jugular vein is reported in 1906 by Crile [17] and is accepted as a safe operative method in later years. We believe that segmental resection should be performed if radical resection is possible. However, the treatment strategy should be considered carefully when it spreads through the distal part across the internal jugular vein. In addition, circulatory dynamics and collateral circulation should be considered. Therefore, the preoperative planning for treatment is important. When the tumor thrombus extends to the innominate vein, SVC, and right atrium, the following procedures might be needed: First, sternotomy is necessary for most cases. It is difficult to operate the innominate vein or SVC from a collar-shaped incision. We believe that full sternotomy is desirable to obtain the operation field that can conduct cannulation and vascular clamp of major vessels. Second, the most important consideration is venous reconstruction or thrombectomy. When the tumor thrombus progresses to the SVC and right atrium, phlebectomy of the innominate vein should be performed for complete resection. Onoda et al. [1] summarized 19 reported surgical cases of thyroid cancer with tumor thrombus in SVC. In their report, thrombectomy was conducted for many cases. As most thyroid cancers are histologically differentiated tumors, tumor thrombus might not invade the vascular wall and thrombectomy without venous resection could be performed. When the thrombectomy is difficult because of tumor invasion, extensive resection and replacement of the SVC should be considered. Sekine et al. [18] reported that prosthetic reconstruction of SVC is an acceptable and feasible operative method. When tumor thrombus progresses to the right atrium, cardiopulmonary bypass is necessary. Yamaguchi et al. [12] reported that tumor thrombus that extended to the right atrium was removed with the right atrium and innominate vein incision by using a cardiopulmonary bypass. Third, the secession of tumor thrombus should be considered perioperatively. Acute pulmonary thrombus is a serious and

potential life-threatening condition with clinical manifestations of hemodynamic instability, acute right ventricular failure, and cardiogenic shock and/or cardiac arrest [19]. In surgical cases of renal cell carcinoma tumor thrombus of the inferior vena cava, an inferior vena cava filter may be used to prevent pulmonary artery tumor thrombus [20]. If tumor thrombus exists in the innominate vein, the use of a SVC filter may be beneficial. However, when tumor thrombus extends to the SVC, insertion of a SVC filter is difficult and more careful operation is required with scrupulous attention. When taping of SVC is troublesome, we regard the induction of the cardiopulmonary bypass as one method to consider. Accurate localization of the tumor thrombus should be evaluated.

Finally, we have experienced an interesting surgical case of thyroid carcinoma with massive venous tumor thrombus that occurred pulmonary embolism during operation. We suggest a safe, effective and reliable management criteria for patients with thyroid carcinoma with venous tumor thrombus.

4. Conclusion

We report a case of thyroid carcinoma with extensive tumor thrombus in the SVC. We would like to emphasize the usefulness of this management criteria. We should perform aggressive resection for patients with extensive venous thrombus if radical resection is possible. Preoperative correct imaging evaluation and operative planning are necessary to perform safe and effective operations. Furthermore, prevention of pulmonary artery thrombus must be considered perioperatively.

Conflicts of interest

I have no conflicts of interest to disclose concerning this case report.

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Ethical approval

No ethical approval is required to publish this case report

Author contribution

Fumiaki K. contributed to operation, follow-up and writing the manuscript.

Masaki T. and Kunihide N. contributed to writing the manuscript.

Hirofumi N., Kousei T., and Hironobu N. contributed to operation.

Hirofumi T. and Hiroaki K. contributed to pathological diagnosis.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy

of the written consent is available for review by the Editor-in-Chief of this journal on request.

Guarantor

Fumiaki Kawano.

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